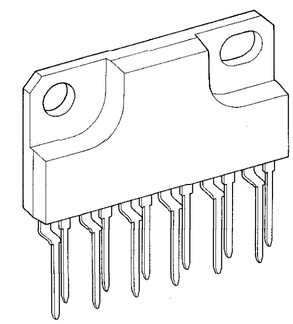
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA7250BP, TA7251BP

30W BTL AUDIO POWER AMPLIFIER

The TA7250BP, TA7251BP are BTL audio power amplifier for consumer applications.
This I_C provides high output power of 23W and also provides wide output power band width.
Normal (TA7250BP) and Reverse (TA7251BP) for easier layout design of PC-board when used in BTL-Stereo application.



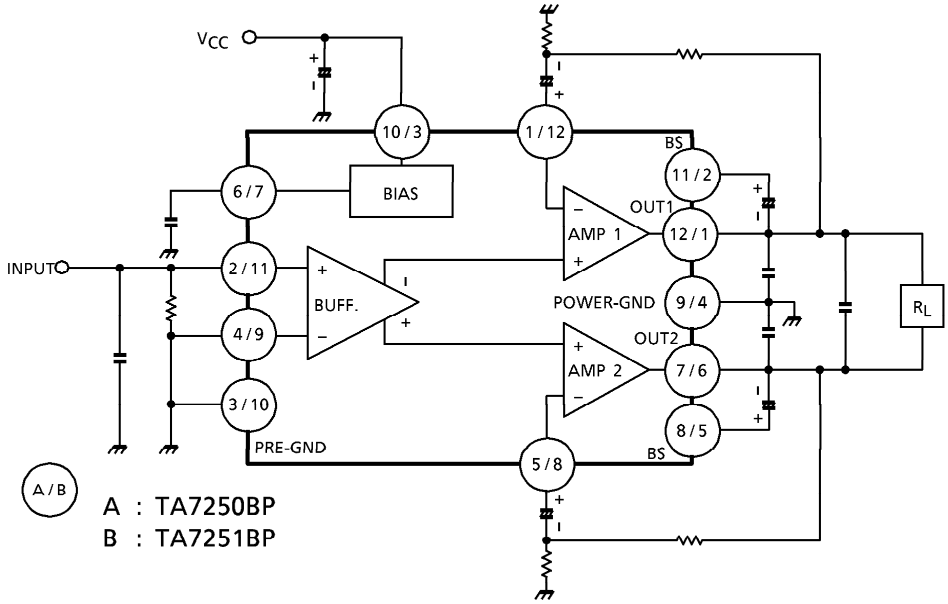
HZIP12-P-1.78B

Weight : 4.04g (Typ.)

FEATURES

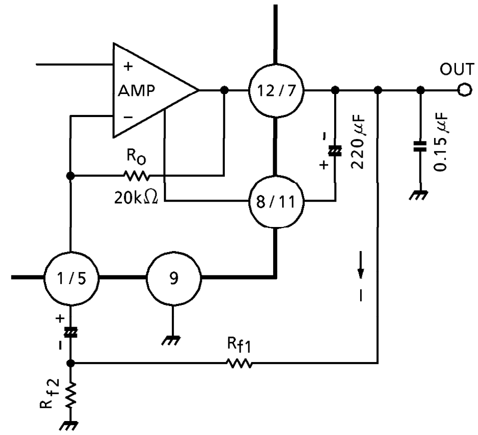
- High Output Power
  : $P_{OUT(1)} = 23W$ (Typ.)
  ($V_{CC} = 13.2V$, $f = 1kHz$, $THD = 10\%$, $R_L = 4\Omega$)
  $P_{OUT(2)} = 30W$ (Typ.)
  ($V_{CC} = 13.2V$, $f = 1kHz$, $THD = 10\%$, $R_L = 2\Omega$)
- Excellent Output Power Band Width
  : $P_{OUT(3)} = 18W$ (Typ.)
  ($V_{CC} = 13.2V$, $f = 50Hz \sim 20kHz$, $THD = 1\%$, $R_L = 4\Omega$)
- Low Distortion
  : $THD = 0.015\%$ (Typ.) ($V_{CC} = 13.2V$, $f = 1kHz$, $P_{OUT} = 4W$, $R_L = 4\Omega$)
- Built In Protector Circuit
  : Thermal Shout Down, Over Voltage Protection (Typ. $V_{CC} = 21V$)
  ASO Protection (R_L Short, Out to GND, Out to V_{CC})
- Operating Supply Voltage Range : $V_{CC\,(opr.)} = 9 \sim 18V$

BLOCK DIAGRAM



APPLICATION INFORMATION

(This explanatory terminal number is for TA7250BP)



(Fig.1)

1. Voltage gain

   The closed loop voltage gain : G_V is determined by R_{f1}, R_{f2} and R_0.
   If $R_o \gg R_{f1} > R_{f2}$

   $$G_V \fallingdotseq 20\ell og \frac{R_{f1}}{R_{f2}} + 6 \text{ (dB)}$$

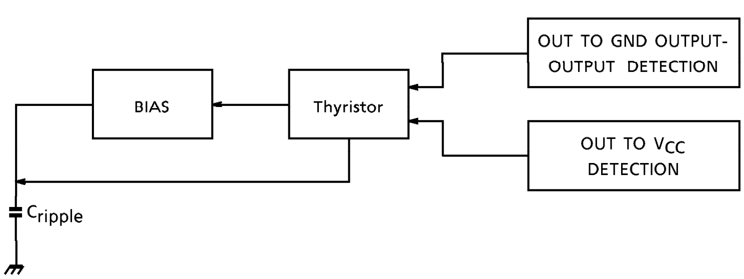
   (R_0 is established 20kΩ)
   Care must be taken, sine the current "I" flows to R_{f1} and R_{f2} from quiescent output voltage at pin⑫ / ⑦ and it is impossible decrease so much R_{f1} and R_{f2}.
   When $G_V = 40$dB, it is recommended to use R_{f1} for 1kΩ and R_{f2} for 20Ω.

2. Oscillation prevention

   For the oscillation prevention, the capacitors should be inserted output terminal to GND and output to another output.
   These are recommended to use the polyester film capacitor which temperature characteristics are better.
   It use ceramic capacitor, the characteristics is liable to be influenced by temperature, than it is better to use the capacitor of which capacity is lager than the recommended value, surely carry out the temperature test, and confirm the oscillation allowance.
   Especially when using this IC with the voltage gain reduced or with the feedback amount increased, the phase inversion is produced in high frequency and the oscillation is liable to be generated.
   Therefore, use this IC at $G_V = 40$dB or over after sufficiently checking the capacity of capacitor, type of capacitor and mounting position of capacitor.

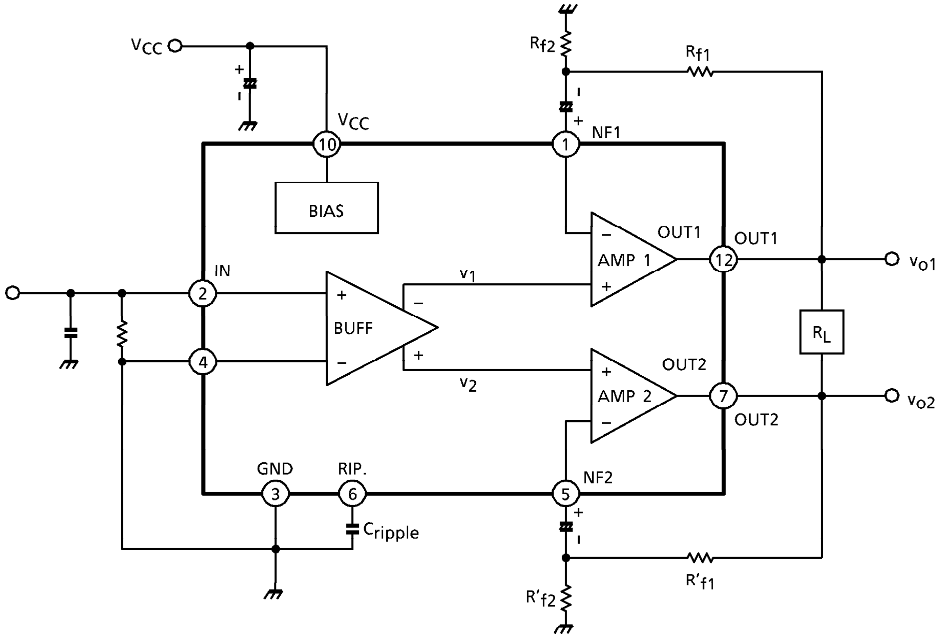
3. Aso circuit

   This IC incorporates the protection circuit of out to V_{CC}, Out to GND and shorting between output and another output.



(Fig.4)

4. R.R. characteristic of ripple rejection



Since the capacity of ripple capacitor of this IC is small R.R., characteristic is influenced described below.

(1) Because C_{ripple} is small (recommended value 0.033μF), the ripple components produced in the bias system are output at the primary stage phase inversion amplifier which gain 1.
These turn into the input signals v_1, v_2 of the power amplifier stage.

(2) v_1 and v_2 are amplifier through the power stage and turned into $v_{o1} - v_{o2}$.
However, because of the BTL operation, $|v_{o1} - v_{o2}|$ appear as the output ripple voltage.
Therefore, by the gain dispersion of the power stage of ch-1 and ch-2, that is by the resistance ratio dispersion of the external feedback resistances R_{f1}, R_{f2}, R'_{f1}, R'_{f2} and inside IC, R.R. characteristic is determined.
Since the pair characteristic of the external feedback resistances ch-1 and ch-2 influences R.R. characteristic, it is advisable to use the high precision resistance of high characteristic.

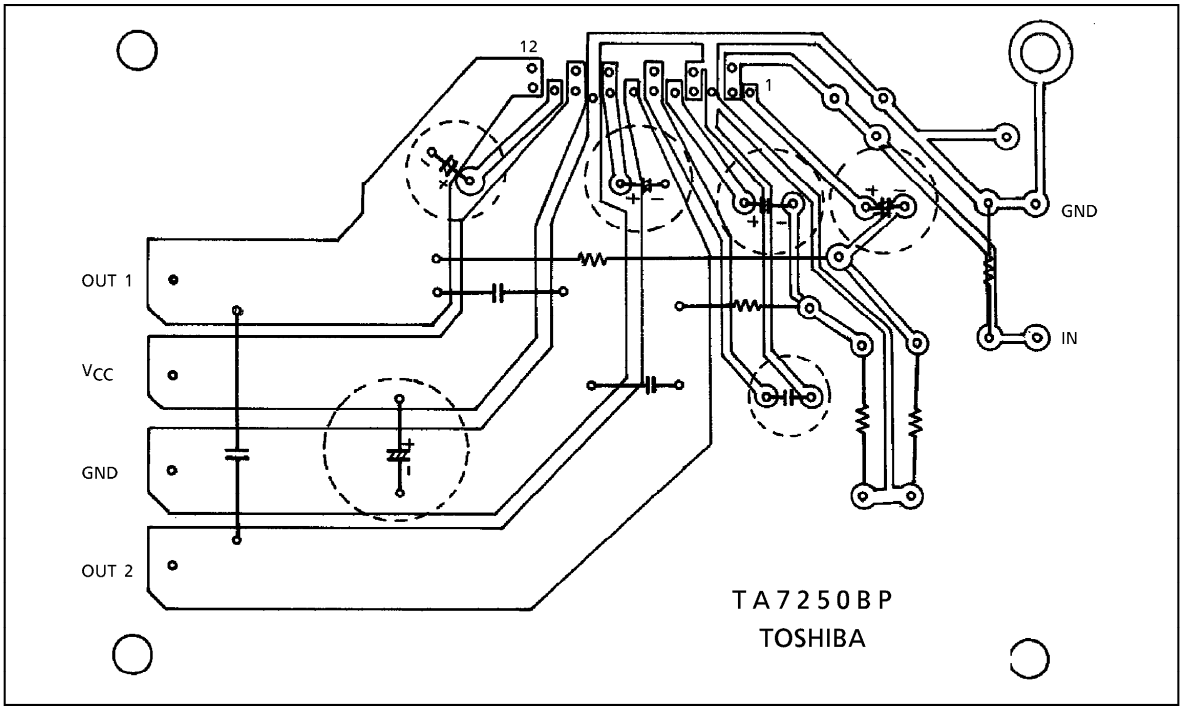
5. Capacity of ripple filter

The ON / OFF time constant of the protector of this IC is determined by the capacity of pin⑥ ripple filter terminal.
Therefore, with the capacity expansion of the ripple capacitor, the ripple rejection is improved, however, the following two problems arise.

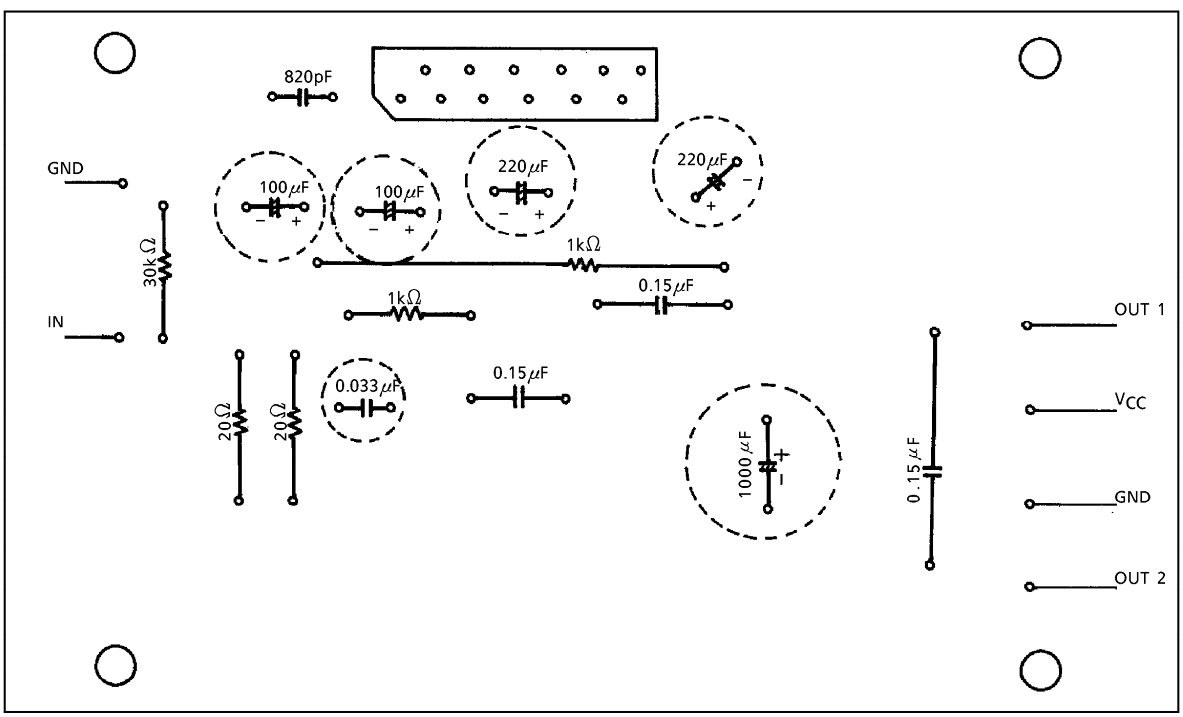
(1) Interruption of sound at excessive input.

(2) Reduction of the protector strength at V_{CC}-short, GND short or OUT-OUT short. Consequently, the capacity of the ripple capacitor is recommended to by 0.033μF.

STANDARD PRINT PATTERN



(Under view)



(Parts description)

MAXIMUM RATINGS ($Ta = 25°C$)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Peak Supply Voltage (0.2s)	V_{CC} (surge)	50	V
DC Supply Voltage	V_{CC} (DC)	25	V
Operating Supply Voltage	$V_{CC\,(opr)}$	18	V
Output Current (Peak)	I_o (peak)	9	A
Power Dissipation	P_D	25	W
Operating Temperature	T_{opr}	−30~85	°C
Storage Temperature	T_{stg}	−55~150	°C

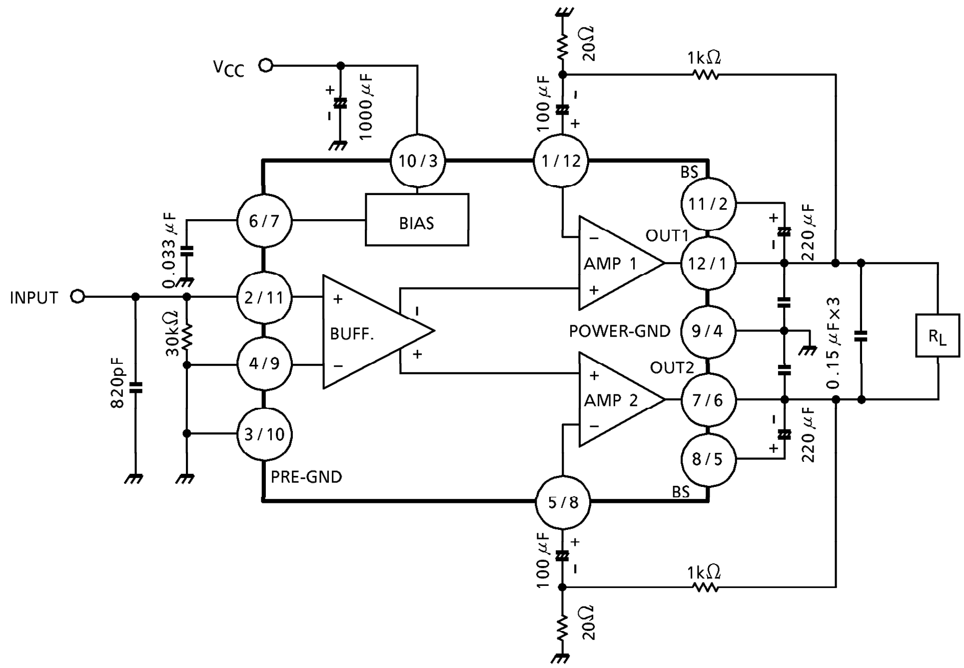
ELECTRICAL CHARACTERISTICS
(Unless otherwise specified, $V_{CC} = 13.2V$, $R_L = 4\Omega$, $R_g = 600\Omega$, $f = 1kHz$, $Ta = 25°C$)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current	I_{CCQ}	—	$V_{IN} = 0$	—	120	200	mA
Output Power	$P_{OUT\,(1)}$	—	THD = 10%	20	23	—	W
	$P_{OUT\,(2)}$	—	THD = 10%, $R_L = 2\Omega$	—	30	—	W
	$P_{OUT\,(3)}$	—	THD = 1%, f = 50Hz~20kHz	—	18	—	W
Total Harmonic Distortion	THD	—	$P_{OUT} = 4W$	—	0.015	0.1	%
Voltage Gain	G_V	—	$V_{IN} = 2.45mV_{rms}$	39.5	41	42.5	dB
Output Noise Voltage	$V_{NO\,(1)}$	—	$R_g = 0$, DIN45405 Noise filter	—	0.25	—	mV_{rms}
	$V_{NO\,(2)}$	—	$R_g = 10k\Omega$, BW = 20Hz~20kHz	—	0.35	0.9	mV_{rms}
Ripple Rejection Ratio	R.R.	—	f = 100Hz $V_{ripple} = 0.775V_{rms}$ (0dBm)	40	47	—	dB

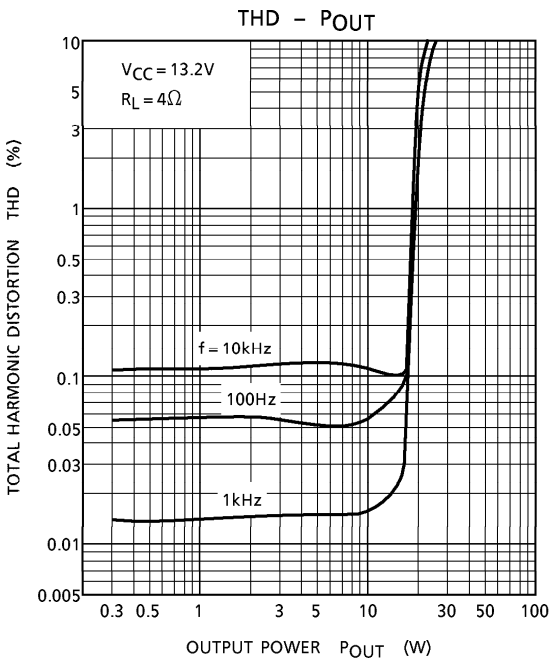
TYP. DC VOLTAGE OF EACH TERMINAL ($V_{CC} = 13.2V$, $Ta = 25°C$)

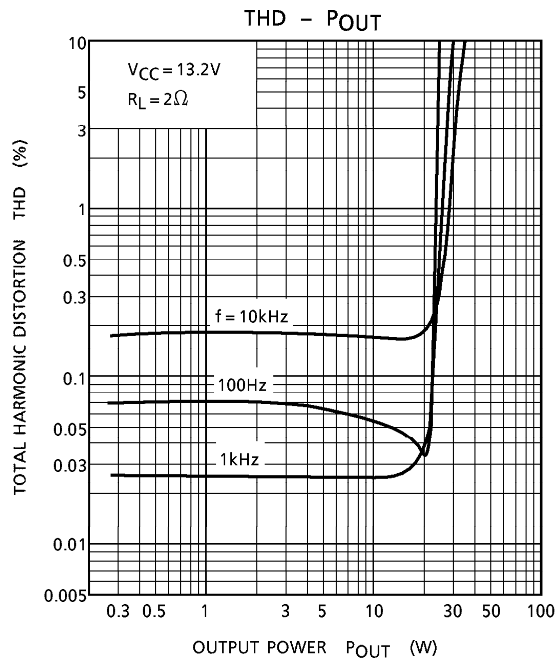
TERMINAL No.		1	2	3	4	5	6	7	8	9	10	11	12
DC Voltage (V)	TA7250BP	1.95	0.01	GND	0	1.95	6.6	6.6	12.5	GND	V_{CC}	12.5	6.6
	TA7251BP	6.6	12.5	V_{CC}	GND	12.5	6.6	6.6	1.95	0	GND	0.01	1.95

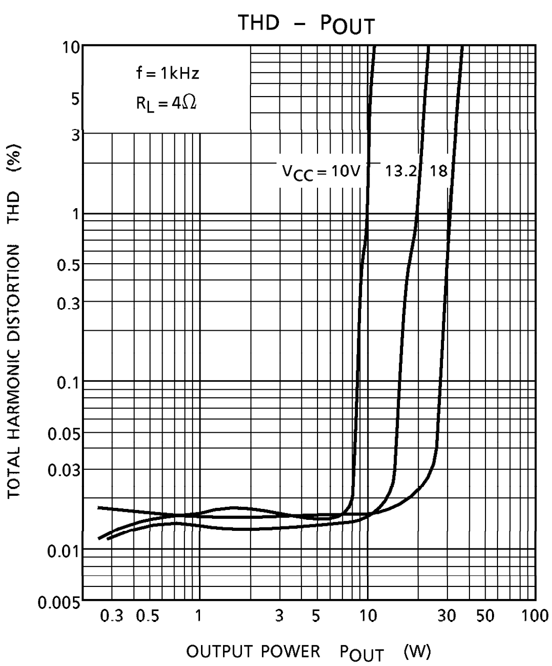
TEST CIRCUIT

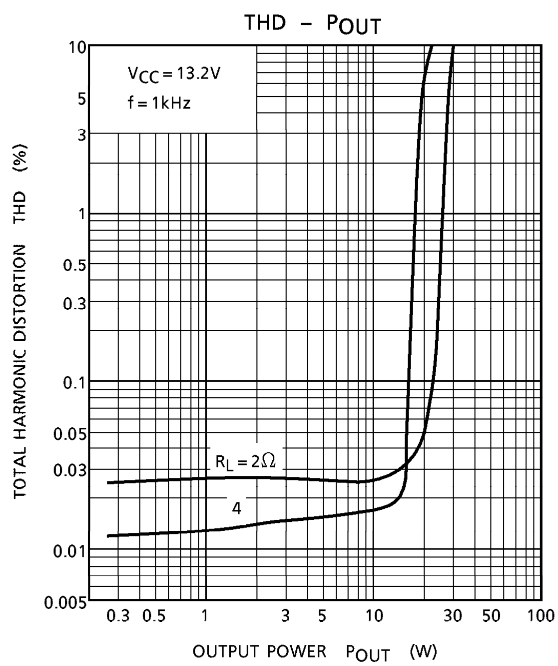


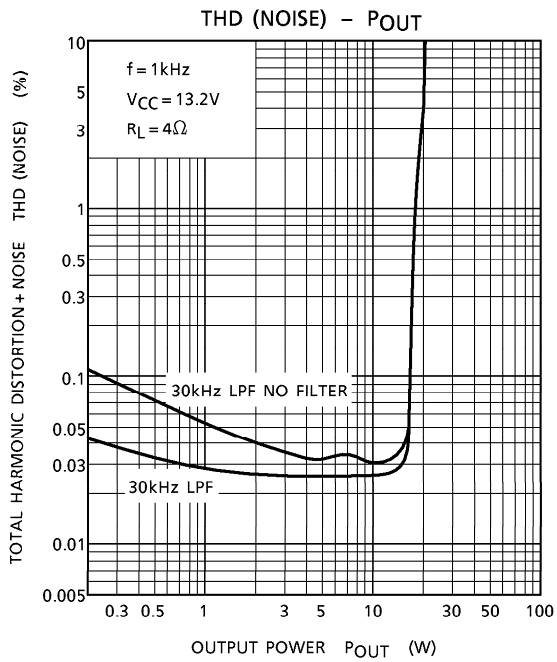
A/B — A : TA7250BP, B : TA7251BP

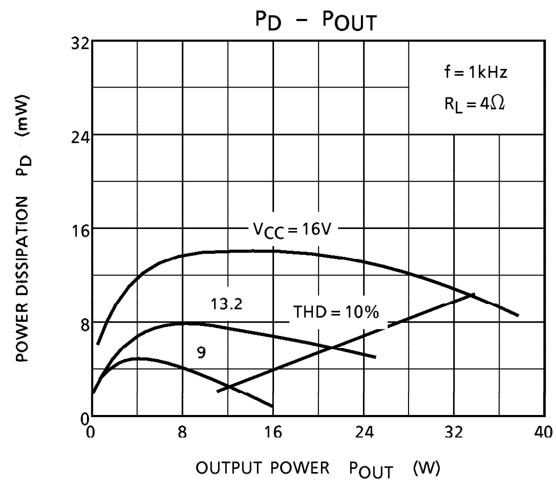

THD – P_{OUT}
V_{CC} = 13.2V
R_L = 4Ω
f = 10kHz
100Hz
1kHz
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER P_{OUT} (W)

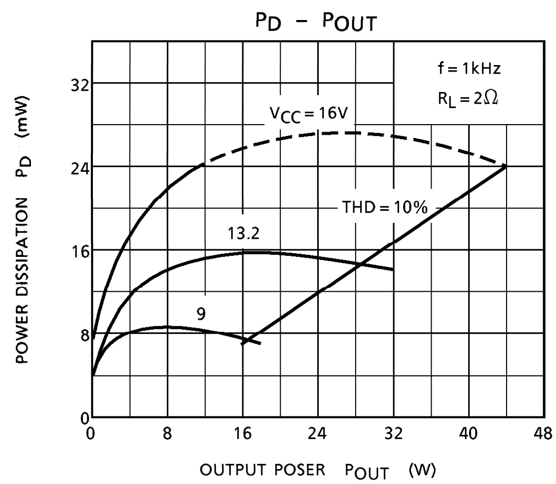

THD – P_{OUT}
V_{CC} = 13.2V
R_L = 2Ω
f = 10kHz
100Hz
1kHz
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER P_{OUT} (W)

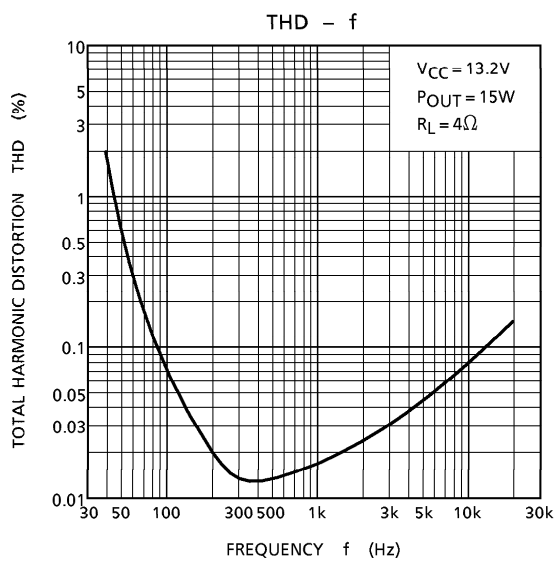

THD – P_{OUT}
f = 1kHz
R_L = 4Ω
V_{CC} = 10V
13.2
18
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER P_{OUT} (W)

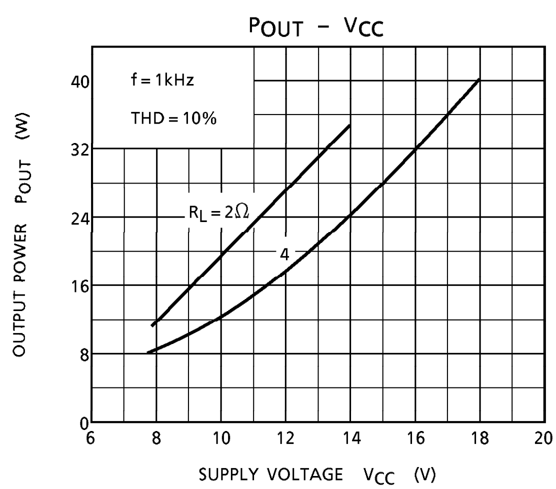

THD – P_{OUT}
V_{CC} = 13.2V
f = 1kHz
R_L = 2Ω
4
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER P_{OUT} (W)

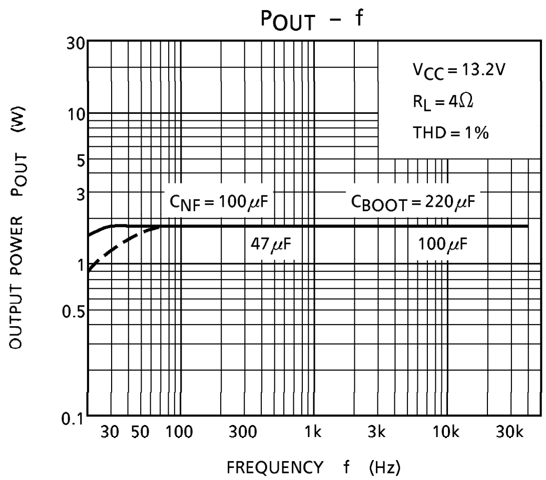

THD (NOISE) – POUT
f = 1kHz
VCC = 13.2V
RL = 4Ω
30kHz LPF NO FILTER
30kHz LPF
TOTAL HARMONIC DISTORTION + NOISE THD (NOISE) (%)
OUTPUT POWER POUT (W)

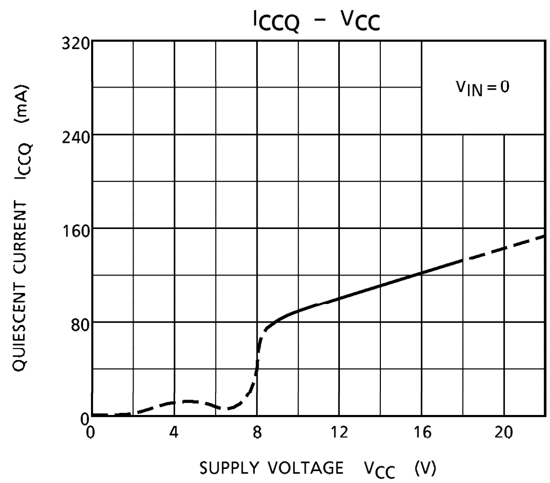

PD – POUT
f = 1kHz
RL = 4Ω
VCC = 16V
13.2
9
THD = 10%
POWER DISSIPATION PD (mW)
OUTPUT POWER POUT (W)

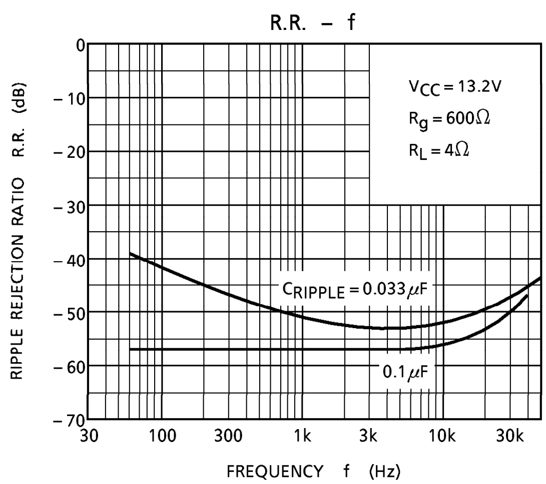

PD – POUT
f = 1kHz
RL = 2Ω
VCC = 16V
13.2
9
THD = 10%
POWER DISSIPATION PD (mW)
OUTPUT POSER POUT (W)

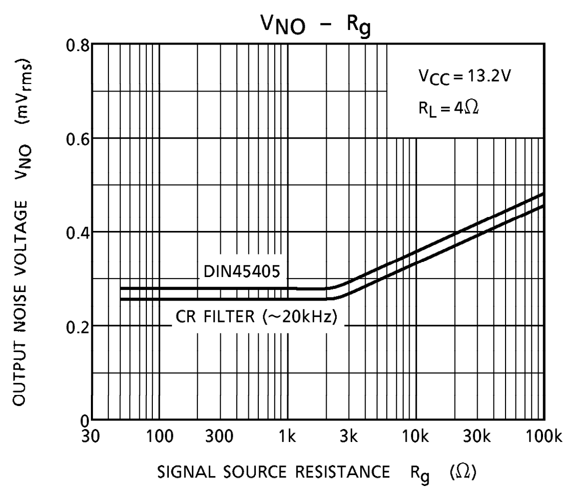

THD – f
VCC = 13.2V
POUT = 15W
RL = 4Ω
TOTAL HARMONIC DISTORTION THD (%)
FREQUENCY f (Hz)

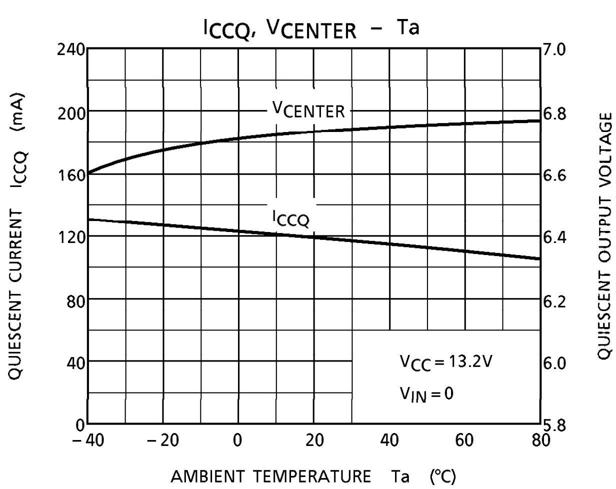

POUT – VCC
f = 1kHz
THD = 10%
RL = 2Ω
4
OUTPUT POWER POUT (W)
SUPPLY VOLTAGE VCC (V)

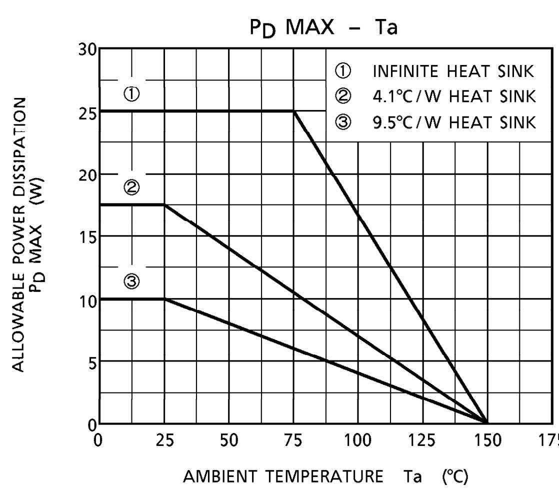

POUT – f
VCC = 13.2V
RL = 4Ω
THD = 1%
CNF = 100μF
CBOOT = 220μF
47μF
100μF
OUTPUT POWER POUT (W)
FREQUENCY f (Hz)


ICCQ – VCC
VIN = 0
QUIESCENT CURRENT ICCQ (mA)
SUPPLY VOLTAGE VCC (V)


R.R. – f
VCC = 13.2V
Rg = 600Ω
RL = 4Ω
CRIPPLE = 0.033μF
0.1μF
RIPPLE REJECTION RATIO R.R. (dB)
FREQUENCY f (Hz)

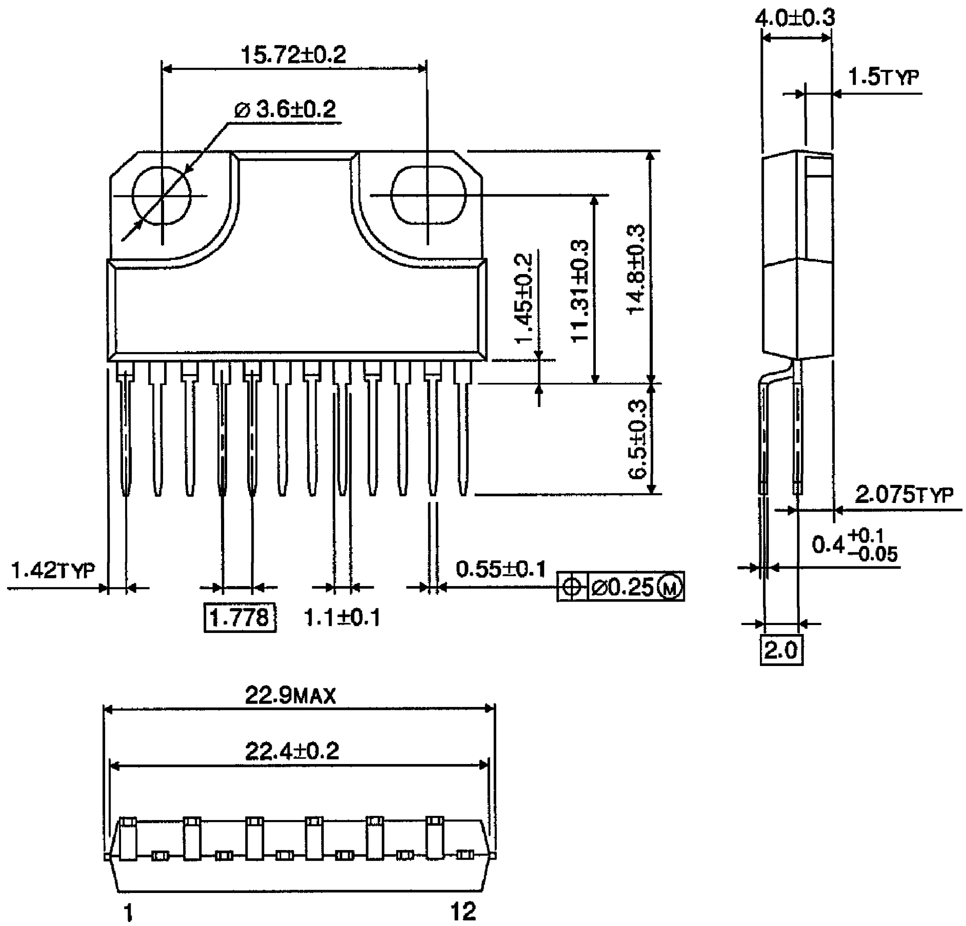

VNO – Rg
VCC = 13.2V
RL = 4Ω
DIN45405
CR FILTER (~20kHz)
OUTPUT NOISE VOLTAGE VNO (mVrms)
SIGNAL SOURCE RESISTANCE Rg (Ω)


ICCQ, VCENTER – Ta
VCENTER
ICCQ
VCC = 13.2V
VIN = 0
QUIESCENT CURRENT ICCQ (mA)
QUIESCENT OUTPUT VOLTAGE VCENTER (V)
AMBIENT TEMPERATURE Ta (°C)


PD MAX – Ta
① INFINITE HEAT SINK
② 4.1°C / W HEAT SINK
③ 9.5°C / W HEAT SINK
ALLOWABLE POWER DISSIPATION PD MAX (W)
AMBIENT TEMPERATURE Ta (°C)

OUTLINE DRAWING
HZIP12-P-1.78B

Unit : mm



Weight : 4.04g (Typ.)